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COAL BEDS IN MERCER, CRAWFORD, VENANGO, FOREST,
WARREN, McKEAN, POTTER, TIOGA and BRADFORD
COUNTIES, PENNSYLVANIA

By

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MERCER COUNTY.

Introduction.

Mercer County is the only county in Pennsylvania that has mined and shipped Pottsville coals on a large commercial scale. These coals are thicker here than elsewhere, and were among the first coals mined in the State.

In 1918 Mercer County stood nineteenth in Pennsylvania as a bituminous coal producer. A total of 690,785 tons valued at \$1,975,177 was produced. 639,324 tons valued at \$1,827,929 were loaded at the mines for shipment; 12,405 tons valued at \$36,149 were sold to local trade and used by employees; 39,056 tons were used at the mines for steam and heat. None of the coal was made into coke at the mines. The Brookville (Pardoel) coal furnished a great part of the output.

Mercer County is on the west boundary of the State and lies between Crawford County on the north and Lawrence County on the south. Its greatest width from east to west is 27 miles and from north to south, 24 miles. Its area is 770 square miles. The population in 1920 was 93,788.

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Mercer County has many railroads. The Bessemer and Lake Erie Railroad enters the county at Grove City, and runs north through Mercer and Greenville to the northern county line. The Pennsylvania Railroad follows the valley of Shenango River from the southern border of the county through Farrell and Sharon, then north to Shenango and Jamestown. The Erie Railroad follows the same route to Shenango, thence north to Greenville and Kennard. A branch of the Pennsylvania Railroad which enters the county at Leesburg, runs north to Mercer and Stoneboro, where it connects with the New York Central Railroad. The latter road enters the county east of Stoneboro and runs northwest to Jamestown and thence to Lake Erie. The Sharpsville Railroad has a few miles of track in the southwestern part of the county. The coal production of the county has many outlets by these railroads to Pittsburgh and to the lakes.

The number of improved roads in Mercer County is growing each year. The dirt roads are good in the summer and fall, but in winter some of them are nearly impassable. These roads are used to a great extent by the farmers for hauling domestic fuel.

The surface of the county is a peneplain spotted with numerous small rounded hills. There are no deeply cut valleys. Many of the main valleys are straight, with gently sloping sides, lacking cliffs or massive outcropping rocks. The surface is covered with many feet of glacial drift which hides the bed rock. Swamps occupy many depressions in the irregular surface left by the glaciers. The rocks are almost horizontal, but locally dip 15 degrees to the southwest.

STRATIGRAPHY.

The upper formations of Pennsylvanian age have been eroded; only the lower part of the Allegheny formation remains in a few isolated hilltops near the southern and eastern county line.

The Pottsville formation, having an average thickness of 250 feet, covers a large part of the county. It is capped by a massive sandstone, averaging 50 feet thick, and the Sharon conglomerate marks the base. The Pottsville formation contains valuable coal and iron beds.

The Mauch Chunk formation has an extensive outcrop in the county. It is composed of green and red shales, and thin sandstones.

The Pocono and Catskill formations may have limited outcrops in the county which are covered with glacial drift.

The lower formations, the Mississippian and Devonian, have been tested for oil and gas, but they are not coal bearing.

COALS.

There were seven workable coal beds in the county, and several other thin and unimportant ones. The Brookville (Pardoe) coal is the only important bed remaining, the others having been mined out.

Sharon Coal. The Sharon coal is the lowest bed (geologically speaking) that has been mined in Pennsylvania. This bed was mined and practically exhausted more than 50 years ago. At the present time, to the knowledge of the author, there is not an opening in this coal in the county. Many thousands of tons were mined from this bed in the detached areas in the western part of the county for use as steam and domestic fuel and in blast furnaces. The coal is low in sulphur, very high in moisture and variable in ash. Locally the fixed carbon is very high, with a correspondingly low percentage of volatile matter. The coal is hard, bright and mines out in good sized lumps. It disintegrates very fast on exposure and is not suitable for storage. Its value for raw use in the iron furnace was due to bands of mineral charcoal distributed through the bituminous matter which prevented the mass from caking.

The bed ranges from a few inches to 5 feet, and averages about 4 feet thick. The coal is generally very clean, with no distinct binders or partings. Locally the coal is so poor that it could be classed as a bituminous shale.

Quakertown Coal. The Quakertown coal is persistent in Mercer County, but nowhere is so thick or pure as the Sharon coal. It is too thin to mine on a commercial scale, but it has been opened for domestic use in a few localities. It is generally an absolutely clean bed of bright shiny coal, low in sulphur, low in ash, high in moisture, and medium in fixed carbon and volatile matter. In Ohio, where it is mined on a large scale, it is highly prized for burning ceramic ware, and for steaming and general heating purposes.

In Mercer County, the Quakertown coal lies from 80 to 100 feet above the Sharon coal. Its horizon is marked in many places by a few inches of coal or several feet of bituminous shale. In several townships, especially East Lackawannock, it is 2 feet thick and has been mined for local use.

Lower Mercer Coal. This unimportant coal, lying about 160 feet above the Sharon coal, is used almost exclusively for domestic fuel. Its maximum thickness is 4 feet. The top half is very impure, and unmineable. Locally the bed is divided into an upper and lower bench by a shale parting near the bottom of the bed ranging from a few inches to several feet thick.

A coal bed occurs in Sandy Lake township between the two Mercer coals. It has been mined, and shows two benches, a top one 4 feet thick separated by 4 feet of fire clay from a lower one 20 inches thick. Where it has been mined at Maple Grove it is fairly clean and free from partings.

Upper Mercer Coal. The Upper Mercer coal, another impure bed, lies from 10 to 16 feet below the base of the Homewood sandstone. This coal is mined only in a few places. The bed is thin, nowhere exceeding 3 feet, and many bands of slate and sulphur make it dirty. Its average thickness is less than 12 inches.

Brookville (Pardo) Coal. The Brookville (Pardo) coal is the most important coal in Mercer County. All the large mines are working this bed, and practically the entire output of the county comes from it. The coal ranges from 3 feet 6 inches to 4 feet thick, and is free from any noticeable impurities, with the exception of a pyrite band of one inch or less, generally from 4 to 10 inches from the top. Locally other binders develop, and a few inches of "draw slate" occur at the top of the bed.

The Brookville is a steam and domestic coal having a low fuel ratio, rather high moisture, ash medium, and sulphur fairly low when the partings are discarded in mining. The coal does not clinker under the boiler. It is rather friable, and breaks up in shipment.

CRAWFORD COUNTY.

Crawford County has practically no workable coal. The Allegheny and higher coal bearing formations are lacking. The Sharon coal in the Pottsville formation, the only bed present, is confined to a few high hills in the southern townships. It is locally 4 feet thick, is variable and dirty, and under such thin cover that it has little or no value.

VENANGO COUNTY.

The lower part of the Allegheny formation and the Pottsville formation, containing several thin and dirty coal beds, outcrop in the tops of the knobs in the southern part of Venango County. The Middle and Lower Kittanning, Clarion and Mercer coals are present, but none of them exceeds 2 feet in thickness. They are extremely impure, and only one, the Clarion, has been opened. This coal was used for raising steam in oil well drilling.

FOREST COUNTY.

The rocks of Forest County lie practically flat, and the Pottsville formation forms a broad plateau, which is deeply entrenched by streams.

About 60 feet of the lower part of the Allegheny formation is present in a few of the high hills through the middle of Jenks township in the southeastern part of the county. These hills contain the Clarion coal, which is locally 2 feet 3 inches thick.



The Mercer (Alton) coals are represented by one or two beds of shaly coal that are locally 3 feet thick, and underlie the higher summits east of Allegheny River.

The Sharon (Upper Marshburg) coal is generally a dirty split bed about 3 feet thick, underlying most of the higher areas.

Coal has not been mined on a commercial scale in the county, as the coals have little value at present.

WARREN COUNTY.

The coal bearing rocks of Warren County consist of the basal sandstones of the Pottsville, which cap the highest points in the southern half of the county. These rocks contain two coals. The upper one, a few feet above the Sharon coal, is thin, averaging less than 12 inches thick, and is very dirty. The Sharon coal averages 2 feet thick, has fair quality, and has furnished much fuel for local use. The roof is taken down for height.

MCKEAN COUNTY.

McKean County is topographically a high plateau, much dissected by streams. The coal bearing formations, the Allegheny and Pottsville, occur in small, isolated areas in the highest points on this plateau.

COAL BEDS.

Sharon (Upper Marshburg) Coal. This bed, lying about 125 feet below the top of the Pottsville conglomerate, has been opened at many places in the Alton and Clermont basins. It averages less than 2 feet thick, and is dirty.

Mercer (Alton) Coal Group. Three coals, lying at the horizon of the Mercer coal, are the most extensive and important coals in the county.

The lower coal is thickest in the eastern part of the county. It has been opened at Hamlin, Splint and Lyman Camp mines, where it averages 4 feet thick. The roof and floor are very rolly, sometimes "cutting out" the bed entirely.

The middle coal is generally composed of two to four benches separated by shale partings. It has been mined at Alton, Lafayette

township, where it ranges from 4 to 8 feet thick, including partings. This is a very unusual thickness.

The upper coal ranges from 2 feet to 3 feet 6 inches thick, and is generally one bench, although locally the bed is full of thin bone partings. This coal was worked many years ago at Buttsville, and near Clermont, but the openings are now fallen shut.

Clarion (Clermont, "A") Coal. This bed, lying from 60 to 70 feet below the Lower Kittanning, has been mined in Sergeant and Norwich townships, but the openings are now abandoned. It is reported 4 feet thick on the head of Indian Run. In the Clermont basin it is 2 feet 4 inches to 3 feet 6 inches thick, it is hard and brittle, high in ash and sulphur, and is nearly 40 per cent volatile matter.

In Davis Hill, Lafayette township, the bed is 3 feet 6 inches to 5 feet thick, with a local parting near the top. The bed is present in several other townships, but averages less than 2 feet thick.

Lower Kittanning (Dagus, "B") Coal. The Lower Kittanning coal underlies about fifty acres in the Clermont Basin, and a few isolated areas in the Norwich Basin. It ranges from 2 feet 6 inches to 3 feet thick, and has fair quality. It is not mined at the present time because roof and bottom "rolls" and its limited area make mining unprofitable.

POTTER COUNTY.

Four or five synclinal basins which cross Potter County in a general northeast-southwest direction, contain a few isolated areas of Allegheny and Pottsville coals. The basal sandstones of the Pottsville make broad table lands, and only the highest hills contain the coal beds.

The Kettle Creek basin is a shallow trough midway between the Blossburg and Gaines coal basins of Tioga County, which spoon out just beyond the Potter County line. This basin has preserved a few acres of coal in a hilltop near Germania, Abbott township. The coal has been mined for local use.

The Pine Creek basin of Potter County is a prolongation of the Gaines basin of Tioga County. A coal bed 3 feet 2 inches thick has been opened on Wittenmore Run. It is hard, clean coal, carrying sulphur 0.9 per cent; ash 9.8 per cent; volatile matter 30.9 per cent. The coal is excellent for steaming and domestic use.

Other basins contain a few isolated areas of inferior coal in the highest hilltops.

TIOGA COUNTY.

Introduction.

The coal bearing formations of Tioga County are contained in two canoe-shaped synclinal basins. The first and most important, the Blossburg basin, extends in a general northeast-southwest direction, across Ward, Covington, Hamilton, Bloss, Duncan, Liberty, and Morris townships. The largest acreages of coal are in Ward, Hamilton, Bloss and Duncan townships; the other townships contain only a few outlying areas.

The second, or Gaines basin, extending diagonally across the county a few miles north of and approximately parallel to the Blossburg basin, has preserved a few small areas of coal in northern Gaines township, and one small area in northern Delmar township.

Tioga County ranks eighteenth in Pennsylvania as a bituminous coal producing county. In 1918, the total production was 834,385 tons, valued at \$2,552,517. Of this amount, 789,407 tons, valued at \$2,425,923 were loaded at the mines for shipment; 33,822 tons, valued at \$96,046 were sold to local trade, and used by employees; 11,156 tons, valued at \$30,548 were used at the mines for steam and heat. None of the coal was coked at the mines.

Tioga County has four minable coal beds, three of which are or have been mined for shipping coal. These beds, situated in small basins, in a region that is otherwise lacking in coal, have had great local importance for many years.

Tioga County is on the northern boundary of the State, between Potter and Bradford counties. Its maximum width from east to west is 37.5 miles, and from north to south 31.5 miles; its area is 1,142 square miles. The population in 1920 was 37,118.

Practically all the highways in the coal districts of Tioga County are improved. They are used for hauling coal to local consumers. During times of high prices these roads were also used for transporting coal to railroad sidings.

The Blossburg district is served by the Erie Railroad which runs through Morris Run, Blossburg, Arnot, Landrus, Morris and Hoytville. The New York Central Railroad runs south to Antrim from Wellsboro. The Buffalo and Susquehanna Railroad serves the Gaines district.

COAL BEDS.

The most important coal bed, the "Bloss," has been correlated as the Lower Kittanning. This correlation has not been proved definitely, but will be used by this Survey until more detailed work

is done. The correlation of the other beds is even more uncertain.

The coals of Tioga County are generally soft and friable, and break up into slack and small lumps, irregular cubes in shape. They have long been classed as semi-bituminous and are used with great success as steam and blacksmithing coals. They range from 17 to 24 per cent volatile matter; 60 to 72 per cent fixed carbon; 6 to 18 per cent ash; and .69 to 3 per cent sulphur.

Coal Beds in the Blossburg Basin.

Bear Creek Coal. This bed, lying from 20 to 40 feet below the "Bloss" bed, is very irregular in thickness and quality. At Fallbrook it ranges from 12 to 30 inches thick, averaging about 20 inches. It is a good, semi-bituminous coal, but higher in ash than the "Bloss." At Morris Run this bed is reported 2 feet 6 inches thick; it averages less than 2 feet thick at Arnot and Antrim. This coal will be important after the "Bloss" has been exhausted.

Bloss (Lower Kittanning ?) Coal. This bed is the most important one in Tioga County. It has been a large producer for many years, and is rapidly being exhausted. At Fallbrook it ranges from 2 feet 6 inches to 4 feet thick, averaging 2 feet 8 inches; locally a bone parting 8 inches thick is present about 6 inches above the bottom. At Morris Run the coal averages 5 feet thick, is regular and has excellent quality. At Arnot the "Bloss" bed averages 2 feet 10 inches thick, and is divided into irregular benches by two to four bone partings, ranging from 1 to 8 inches thick. The coal ranges from 2 to 3 feet thick at Antrim and generally carries one or two bone partings 1 to 6 inches thick. An average of eight analyses of the Bloss coal gives: volatile matter 19.74, fixed carbon 68.97, sulphur 0.68, and ash 9.13 per cent.

Morgan Coal. This coal, lying about 40 feet above the Bloss coal, is generally of mineable thickness but is invariably full of clay shale and bone partings. At Fallbrook it is 2 feet 1 inch thick, including a 3 inch shale parting, 10 inches above the bottom. Both benches contain numerous "knife blades" of pyrite and bone. At Morris Run, Arnot and Antrim the bed ranges from 12 inches to 3 feet thick and is too dirty to be mined profitably at present.

Seymour Coal. This bed, lying about 140 feet above the Bloss bed, will be important in the future. It is 2 feet 8 inches thick at Fallbrook, 2 feet 6 inches at Morris Run; at Arnot 2 feet 8 inches; at Antrim it is locally 5 feet thick, but averages less than 3 feet. The coal is very high in sulphur.

Several other thin coal beds, lying at different intervals above and below the "Bloss" bed, are thin and unimportant.

GAINES DISTRICT.

The Gaines coal basin is at Gurnee on the crest of the mountain 4 miles northeast of Gaines. The coal is in the Pottsville formation 160 feet above the Sharon conglomerate.

"Coal has been known to occur in the Gaines basin for half a century or more and was actively exploited about twenty-five years ago. At that time careful examinations were undertaken and openings on coal were made at many points, on the basis of which a minutely detailed geologic section showing the presence of 11 coals, 4 of which were reported to be 3 feet or more in thickness, was made out. On the basis of this section and the accompanying report a company was organized, a railroad built up the side of the mountain from Lansing, 700 feet below, and a mine opened on the most promising bed, then known as the Knox and Billings coal. This coal proved to be of good quality and to possess a fairly persistent thickness of about 3 feet, and was actively mined for a number of years. The mining developments, however, brought to light unexpected dips, and the coal, instead of underlying the whole of the broad flats of the mountain top, was found to underlie an area of less than a square mile. It also gradually became certain that the many openings, supposedly on different coals, were in reality on a single bed, with the exception of a 3-inch bed occurring 15 or 20 feet above the top of the conglomerate. The area was long ago exhausted of all the coal that could profitably be mined by the larger company, and the mines were practically abandoned, though they have since been reopened and are still worked on a small scale by Mr. P. Smith, who was foreman of the company.

The coal is cuboidal and on a fresh surface is seen to consist of deep black, shiny layers alternating with duller partings of amorphous carbon. It is rather soft and friable and carries considerable sulphur. Its coke is also friable but meets the requirements of good blacksmiths coal, for which use it is in considerable demand. It is popular in the surrounding country for general heating purposes, and at the present time is also in demand as a fuel in the nearby oil field."

The foregoing quotation is from the Gaines folio of the Geologic Atlas of the United States, published by the U. S. Geological Survey in 1903.

In the summer of 1921, L. H. Woodcock, R. D. No. 4, Westfield, who lives at Gurnee, opened a drift mine near the top of a hill at Gurnee and in August 1922 was employing 5 miners to supply a steady local demand for coal. The drift at that time was 120 feet long. The thickness of the bed is as follows:



Woodcock mine, Gaines district.

Main heading

Second left room

	inches		inches
Laminated bone	2	Laminated coal	1
Bright coal	5	Dull coal	7
Dirt	$0\frac{1}{2}$	Bone	1
Bright coal	2	Dull coal	10
Dirt	1	Bone	$1\frac{1}{2}$
Dull coal	14	Dull coal	$1\frac{1}{2}$
	<hr/>		<hr/>
	$24\frac{1}{2}$		22

BRADFORD COUNTY.

Introduction.

The coal bearing formations of Bradford County are confined to the Barclay basin in Barclay and Leroy townships. There are possibly 30,000 acres in the field, which contains the Lower Kittanning and Brookville coals. The production is small, and at the present time none of the mines are working.

The Barclay basin is served by the Susquehanna and New York Railroad.

COAL BEDS.

Brookville ("A") Coal. This bed, lying from 60 to 80 feet below the Lower Kittanning coal, ranges from 12 inches to 3 feet 6 inches thick. It locally has an 8 inch shale parting in the middle, in addition to numerous "knife blades" of bone. Locally the coal is canneloid in physical character, but generally it is tender and breaks in long sticks.

The Brookville coal belongs to the semi-bituminous type. The percentage of water is 0.85; volatile matter 16.6; fixed carbon 67.2; sulphur .5; ash 14.7.

Lower Kittanning ("B") Coal. The Lower Kittanning is the most important coal in the Barclay basin, and yields nearly the total production. Its area is smaller than that of the Brookville.

The Lower Kittanning coal is generally a trip bed, consisting of three benches of coal, separated by shale partings, ranging from 2 to 8 inches thick. The lower bench ranges from 10 inches to 3 feet thick, and is friable, columnar in structure, and deep black in color. The middle bench ranges from 4 to 18 inches thick, and is also soft and friable. The top bench ranges from 16 inches to 2 feet thick, and is harder, and does not break up when mined.

The Lower Kittanning coal averages 17 per cent volatile matter, 70 per cent fixed carbon, .8 per cent sulphur, and 10 per cent ash. The coal is excellent for steaming and smelting purposes.

